MAKING SENSE OF THE CENSUS

GRADES: 9-12

SUBJECT: Math

OBJECTIVE: Students will compare properties of the mean and the median using NASS data.

BACKGROUND

During the Civil War, the U.S. Department of Agriculture (USDA) collected and distributed crop and livestock statistics to help farmers assess the value of the goods they produced. At that time, commodity buyers usually had more current and detailed market information than did farmers. This circumstance often prevented farmers from getting a fair price for their goods. Producers in today's marketplace would be similarly handicapped were it not for the information provided by the USDA's National Agricultural Statistics Service (NASS).

NASS conducts weekly, monthly, quarterly and annual surveys and the five-year census of agriculture. Surveys provide current information about production, economics and environmental topics.

The five-year census of agriculture is the most comprehensive, detailed information-gathering program for agriculture. It is a complete accounting of agricultural production in the United States and is the only source of uniform, comprehensive agricultural data for every county in the nation. From 1840 to 1920 the census of agriculture was taken every 10 years. Since 1925 the census has been taken every five years (currently in the years ending in 2 and 7) to coincide with other economic censuses covering manufacturing, mining and construction. The 2002 Census of Agriculture is the nation's 26th census. Anyone who receives a census report form is required by law to complete and return it.

NASS requests information from farm operators on the following subjects:

- Land use and ownership.
- Irrigated land.

- Crop acreage and quantities harvested.
- Livestock and poultry.
- Value of products sold.
- Payments for participation in federal farm programs.
- Amount received from Commodity Credit Corporation loans.
- Number of hired farm workers.
- Operator characteristics.

Twenty-five percent of the report forms include additional questions on the following:

- Production expenses.
- Fertilizer and chemicals.
- Machinery and equipment.
- Market value of land and buildings.
- Income from farm-related sources.

Report forms are tailored for various parts of the country and are specific to the crops grown in a farmer's particular area.

Besides helping the farmer get a fair price for the goods produced on his or her farm, census of agriculture data helps all of us as we plan for the future sustained by a safe and secure food supply.

Agribusinesses use census data to develop market strategies and to determine the most effective locations for service to agricultural producers. Farm organizations use it to evaluate and propose programs and policies that can help agricultural producers. Our elected representatives use census data to develop programs to protect and promote U.S. agriculture. Rural electric companies use the data to forecast future energy needs for agricultural producers and their communities. Colleges and universities use it in research programs to develop new and improved methods to increase agricultural production. State departments of agriculture use census data to plan for operations during drought and emergency outbreaks of diseases or infestation of pests.

NASS survey and census data would just be a sea of numbers without tools for interpreting it. Statistics is the branch of mathematics that collects, organizes, and analyzes data. Various statistical operations can be performed on data such as those collected in a survey or census. One such operation is measures of central tendency. Measures of central tendency show averages. Median and mean are two types of central tendencies.

The **median** is a measure of the "middle" of the data. For an

VOCABULARY
statistics
mean
median
central tendency
data
uniform
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assess
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odd number of data points arranged in ascending order, the median is actually the middle value. For an even number of data points it is the value halfway between the two middle data points. For example, census data for 1997 reports the number of farms for Payne County, Oklahoma, as being 1,110 in 1987; 1,115 in 1992; and 1,281 in 1997. In this set, the median, the middle number, is 1,115. Another set of data, for the entire U.S., shows 2,197,690 in 1994; 2,196,400 in 1995; 2,190,500 in 1996; and 2,190,510 in 1997. In this set, since there is an even number of data points, the median would be 2,193,450 (the halfway point between 2,196,400 and 2,190,500).

The **mean** is computed by adding all the numbers in the set (1,110, 1,115, and 1,281, in the case of number of farms in Payne County, Oklahoma) and dividing the sum by the number of elements added (3). So the mean number of farms for Payne County, Oklahoma, from 1987 to 1997, would be 1,168.

ACTIVITY

1. Ask students what they know about statistics. How do statistics affect their daily lives? For example, those who are athletes might think of how statistics help them know how well they are performing.
2. Share background information about the census of agriculture. Ask students why it would be important to gather statistical information about agriculture. Explain that learning to interpret statistics can help them make good decisions as consumers and citizens.
3. Hand out the data showing statistical information about the number of farms in the U.S. between 1978 and 1997. Explain median and mean. (See background information.) On the chalkboard, write the number in the bottom right corner of each chart indicating the total number of farms in the U.S. for the years 1978-1997. As a class, find the median and the mean from that set of numbers.
4. Divide students into groups. Assign one region to each group, and hand out the worksheets. Have students work in groups to complete a worksheet for each region.
5. Have students report their findings and discuss what the numbers say about trends in agriculture for each region. Are farms growing larger as the total number of farms decrease?
6. Discuss central tendency. Ask which would be least influenced by a change in one of the individual numbers—mean or median?

What sorts of changes in a data set make the mean change? What sorts of changes in a data set make the median change? Discuss how these changes would affect interpretation of the census data.

ADDITIONAL ACTIVITIES

1. Have students look for examples in the popular press where the mean of a data set is cited and other examples where the median is cited. Why do you think the authors of those articles chose to cite those particular measures of center? Would readers have received a different impression of the data under discussion if other (or additional) measures of center had been reported?
2. If computers and Internet connections are available, direct students to the NASS Web site, www.usda.gov/nass/. For Census of Agriculture data, go to "Census of Agriculture, then "Highlights. Click on your state, then "[your county] Census Highlights." Have students find data for your state or county showing number of farms and economic sales classes for 1978 through 1997. Using the mean and median, have students describe the trends for farms in your county.
3. On the NASS Web site, have students find the top three crops grown in your state and county. Students may use NASS survey data, which provide more current estimates, or census information data, which provide information that is more comprehensive and is the only source of uniform agricultural data for every county in the United States.
4. Instruct students to find 10 other states or counties that grow the same crops as those grown in your state, and create a graph that shows the median and mean for production levels. Ask students "If you wanted to build a processing plant to add value to that crop, how might this historical data be useful?"

Name _____

Making Sense of the Census

Region_____

Total number of farms

1978_____ 1982_____ 1987_____ 1992____ 1997_____

Median_____ Mean_____

Farms earning $1,000-9,999

1978_____ 1982_____ 1987_____ 1992____ 1997_____

Median_____ Mean_____

Farms earning $10,000-99,999

1978_____ 1982_____ 1987_____ 1992____ 1997_____

Median_____ Mean_____

Farms earning $100,000 and over

1978_____ 1982_____ 1987_____ 1992____ 1997_____

Median_____ Mean_____

Did the total number of farms increase or decrease between 1978 and 1997?

Did the total number of farms earning $1,000-9,999 increase or decrease between 1978 and 1997?

Did the total number of farms earning $10,000-90,999 increase or decrease between 1978 and 1997?

Did the total number of farms earning $100,000 or more increase or decrease between 1978 and 1997?

What conclusions can you draw about this region from the statistics?

NUMBER OF FARMS: ECONOMIC SALES CLASS BY STATE, REGION, AND UNITED STATES, 1978

	$1,000-9,999	$10,000-99,999	$100,000 & Over	Total
NORTHEAST				
Connecticut	1,480	1,190	490	3,160
Maine	2,645	2,311	902	5,858
Massachusetts	2,207	1,735	487	4,429
New Hampshire	1,213	708	196	2,117
New Jersey	3,601	2,890	914	7,405
New York	15,388	19,621	4,457	39,466
Pennsylvania	23,706	23,097	4,262	51,065
Rhode Island	323	236	52	611
Vermont	1,689	2,804	767	5,260
TOTAL	52,252	54,592	12,527	119,371
NORTH CENTRAL				
Illinois	26,802	57,993	17,235	102,030
Indiana	31,669	38,746	8,489	78,904
Iowa	21,231	76,002	22,405	119,638
Kansas	24,519	40,397	6,928	71,844
Michigan	27,323	23,039	4,302	54,664
Minnesota	26,298	57,810	9,955	94,063
Missouri	51,892	50,077	6,861	108,830
Nebraska	12,108	40,434	10,324	62,866
North Dakota	7,490	28,891	3,434	39,815
Ohio	38,285	38,899	6,453	83,637
South Dakota	7,950	26,428	3,615	37,993
Wisconsin	25,128	50,358	6,442	81,928
TOTAL	300,695	529,074	106,443	936,212
SOUTH				
Alabama	26,473	12,912	3,964	43,349
Arkansas	25,287	15,125	7,076	47,488
Delaware	982	1,375	937	3,294
Florida	15,855	11,653	4,211	31,719
Georgia	22,468	16,507	6,485	45,460
Kentucky	58,894	35,724	2,630	97,248
Louisiana	14,503	8,084	3,362	25,949
Mississippi	23,225	10,133	4,308	37,666
North Carolina	36,565	31,251	6,960	74,776
Oklahoma	36,504	27,114	3,686	67,304
South Carolina	13,376	7,535	2,044	22,955
Tennessee	56,184	21,310	2,572	80,066
Texas	92,013	55,075	12,808	159,896
Virginia	27,978	14,629	2,843	45,450
West Virginia	11,409	2,337	350	14,096
TOTAL	468,194	276,583	66,417	811,194
WEST				
Alaska	228	79	20	327
Arizona	2,295	1,792	1,512	5,599
California	26,531	24,572	13,457	64,560
Colorado	9,120	12,117	3,550	24,787
Hawaii	2,294	1,248	280	3,822
Idaho	8,178	11,476	3,255	22,909
Montana	6,418	13,354	2,727	22,499
Nevada	929	900	373	2,202
New Mexico	5,394	4,052	1,320	10,766
Oregon	14,053	8,478	2,863	25,394
Utah	5,982	4,611	961	11,554
Washington	12,511	10,975	4,831	28,317
Wyoming	2,313	4,118	1,141	7,572
TOTAL	96,246	97,772	36,290	230,308
US	917,387	958,021	221,677	1,867,104

NUMBER OF FARMS: ECONOMIC SALES CLASS BY STATE, REGION, AND UNITED STATES, 1982

	$1,000-9,999	$10,000-99,999	$100,000 & Over	Total
NORTHEAST				
Connecticut	1,560	1,033	562	3,155
Maine	2,722	1,960	916	5,598
Massachusetts	2,203	1,760	658	4,621
New Hampshire	1,222	641	277	2,140
New Jersey	3,597	2,565	1,111	7,273
New York	13,585	15,572	7,396	36,553
Pennsylvania	20,986	19,959	7,241	48,186
Rhode Island	295	202	69	566
Vermont	1,792	2,276	1,341	5,409
TOTAL	47,962	45,968	19,571	113,501
NORTH CENTRAL				
Illinois	23,198	47,398	23,467	94,063
Indiana	27,027	32,777	11,794	71,598
Iowa	18,638	63,724	29,832	112,194
Kansas	21,028	37,416	10,514	68,958
Michigan	23,645	21,812	6,639	52,096
Minnesota	49,320	42,057	9,154	100,531
Missouri	51,892	50,077	6,861	108,830
Nebraska	9,766	34,121	147,051	190,938
North Dakota	5,651	23,575	6,340	35,566
Ohio	34,705	34,899	8,832	78,436
South Dakota	6,384	23,305	6,225	35,914
Wisconsin	20,123	43,195	13,880	77,198
TOTAL	261,214	454,198	290,785	1,006,197
SOUTH				
Arkansas	22,562	12,670	8,169	43,401
Delaware	928	1,158	1,022	3,108
Florida	14,738	10,085	4,707	29,530
Georgia	20,408	13,603	7,751	41,762
Kentucky	52,227	37,928	4,159	94,314
Louisiana	13,522	7,542	3,978	25,042
Maryland	6,271	5,343	2,782	14,396
Mississippi	20,412	8,833	4,842	34,087
North Carolina	30,421	24,250	9,019	63,690
Oklahoma	33,742	24,410	5,080	63,232
South Carolina	11,641	6,233	2,344	20,218
Tennessee	53,563	21,945	3,524	79,032
Texas	91,533	49,972	13,804	155,309
Virginia	27,164	14,030	3,920	45,114
West Virginia	10,976	2,330	474	13,780
TOTAL	410,108	240,332	75,575	726,015
WEST				
Alaska	353	82	26	461
Arizona	2,698	1,637	1,587	5,922
California	28,227	23,819	15,745	67,791
Colorado	8,607	10,654	4,423	23,684
Hawaii	2,222	1,422	360	4,004
Idaho	7,605	10,003	4,731	22,339
Montana	5,951	11,223	4,343	21,517
Nevada	991	926	436	2,353
New Mexico	5,604	3,788	1,477	10,869
Oregon	15,791	7,973	3,840	27,604
Utah	6,151	4,430	1,341	11,922
Washington	13,898	9,451	6,203	29,552
Wyoming	2,550	4,047	1,369	7,966
TOTAL	100,648	89,455	45,881	235,984
US	819,932	829,953	431,812	2,081,697

NUMBER OF FARMS: ECONOMIC SALES CLASS BY STATE, REGION, AND UNITED STATES, 1987

	$1,000-9,999	$10,000-99,999	$100,000 & Over	Total
NORTHEAST				
Connecticut	1,437	958	529	2,924
Maine	2,625	1,719	902	5,246
Massachusetts	2,584	1,779	720	5,083
New Hampshire	1,176	540	264	1,980
New Jersey	4,039	2,411	1,088	7,538
New York	12,070	13,323	7,299	32,692
Pennsylvania	19,227	19,293	7,614	46,134
Rhode Island	299	175	75	549
Vermont	1,772	1,891	1,394	5,057
TOTAL	45,229	42,089	19,885	107,203
NORTH CENTRAL				
Illinois	21,595	43,040	19,647	84,282
Indiana	24,829	29,533	10,953	65,315
Iowa	18,767	55,844	26,787	101,398
Kansas	21,313	33,349	9,379	64,041
Michigan	20,414	17,784	6,396	44,594
Minnesota	20,641	41,956	16,406	79,003
Missouri	45,783	40,904	8,892	95,579
Nebraska	11,515	32,909	13,979	58,403
North Dakota	5,917	22,350	5,947	34,214
Ohio	31,687	31,320	8,541	71,548
South Dakota	6,714	21,496	6,782	34,992
Wisconsin	18,576	26,392	15,357	60,325
TOTAL	247,751	396,877	149,066	793,694
SOUTH				
Alabama	22,390	9,490	4,486	36,366
Arkansas	21,313	12,302	9,100	42,715
Delaware	827	751	1,108	2,686
Florida	15,008	9,871	4,796	29,675
Georgia	19,080	11,215	6,896	37,191
Kentucky	49,261	30,485	3,547	83,293
Louisiana	11,985	6,889	3,709	22,583
Maryland	5,872	4,196	2,586	12,654
Mississippi	16,796	7,551	4,417	28,764
North Carolina	26,205	17,603	8,118	51,926
Oklahoma	32,325	23,584	5,071	60,980
South Carolina	10,204	4,777	1,905	16,886
Tennessee	46,446	18,292	3,464	68,202
Texas	91,516	52,415		143,931
Virginia	23,211	12,025	2,577	37,813
West Virginia	10,113	2,764	486	13,363
TOTAL	402,522	224,210	62,266	689,028
WEST				
Alaska	270	128	39	437
Arizona	2,631	18,732	1,707	23,070
California	26,997	25,786	17,071	69,854
Colorado	8,325	10,678	4,409	23,412
Hawaii	2,171	1,674	375	4,220
Idaho	7,566	9,214	4,453	21,233
Montana	6,302	11,671	4,197	22,170
Nevada	1,114	973	504	2,591
New Mexico	5,660	4,028	1,615	11,303
Oregon	14,997	7,863	3,845	26,705
Utah	5,870	4,549	1,389	11,808
Washington	12,667	9,347	5,940	27,954
Wyoming	2,522	3,892	1,583	7,997
TOTAL	97,092	108,535	47,127	252,754
US	792,624	771,711	278,344	1,698,748

NUMBER OF FARMS: ECONOMIC SALES CLASS BY STATE, REGION, AND UNITED STATES, 1992

	$1,000-9,999	$10,000-99,999	$100,000 & Over	Total
NORTHEAST				
Connecticut	1,379	943	446	2,768
Maine	2,371	1,622	903	4,896
Massachusetts	1,987	1,634	741	4,362
New Hampshire	1,070	583	266	1,919
New Jersey	3,858	2,564	1,060	7,482
New York	10,193	10,730	7,327	28,250
Pennsylvania	15,624	16,355	9,012	40,991
Rhode Island	268	197	77	542
Vermont	1,742	1,527	1,465	4,734
TOTAL	38,492	36,155	21,297	95,944
NORTH CENTRAL				
Illinois	17,555	33,735	22,186	73,476
Indiana	21,210	24,632	12,056	36,688
Iowa	15,956	46,242	30,882	93,080
Kansas	17,569	29,796	11,669	59,034
Michigan	17,173	16,598	7,075	40,846
Minnesota	17,086	33,837	19,102	70,025
Missouri	41,217	36,613	10,600	88,430
Nebraska	8,672	26,081	16,191	50,944
North Dakota	4,424	16,752	8,678	29,854
Ohio	26,333	28,283	9,674	64,290
South Dakota	5,783	18,114	8,714	32,611
Wisconsin	16,654	28,783	17,313	62,750
TOTAL	188,422	339,466	174,140	702,028
SOUTH				
Alabama	18,638	8,915	4,885	32,438
Arkansas	18,526	11,402	9,720	39,648
Delaware	656	685	1,091	2,432
Florida	13,079	9,837	5,108	28,024
Georgia	17,207	10,256	7,048	34,511
Kentucky	42,621	35,496	5,030	83,147
Louisiana	10,900	6,412	4,161	21,473
Maryland	4,814	3,822	2,710	11,346
Mississippi	15,450	7,048	4,624	27,122
North Carolina	21,260	15,678	9,342	46,280
Oklahoma	29,578	23,645	5,993	59,216
South Carolina	9,667	4,666	2,021	16,354
Tennessee	41,558	20,410	3,937	65,905
Texas	84,300	53,074	17,051	154,425
Virginia	20,793	12,614	4,214	37,621
West Virginia	10,025	3,127	619	13,771
TOTAL	359,072	227,087	87,554	673, 713
WEST				
Alaska	224	125	34	383
Arizona	2,193	1,726	1,463	5,382
California	22,211	22,583	17,817	62,611
Colorado	8,318	10,250	4,895	23,463
Hawaii	2,255	1,638	439	4,332
Idaho	6,842	7,889	4,890	19,621
Montana	5,560	9,992	4,861	20,413
Nevada	1,013	889	482	2,384
New Mexico	5,634	4,029	1,804	11,467
Oregon	14,066	7,924	4,175	26,165
Utah	5,552	4,445	1,500	11,497
Washington	10,604	8,058	6,659	25,321
Wyoming	2,269	3,662	1,855	7,786
TOTAL	86,741	83,210	50,874	220,825
US	672,727	685,918	333,865	1,472,068

NUMBER OF FARMS: ECONOMIC SALES CLASS BY STATE, REGION, AND UNITED STATES, 1997

	$1,000-9,999	$10,000-99,999	$100,000 & Over	Total
NORTHEAST				
Connecticut	1,588	1,003	464	3,055
Maine	2,397	1,626	767	4,790
Massachusetts	2,092	1,728	859	4,679
New Hampshire	1,389	693	275	2,357
New Jersey	3,946	2,386	1, 161	7,493
New York	10,544	10,277	6,865	27,686
Pennsylvania	15,406	14,978	9,598	39,982
Rhode Island	275	246	97	618
Vermont	2,097	1,632	1,333	5,062
TOTAL	39,734	34,569	21,419	95,722
NORTH CENTRAL				
Illinois	15,853	26,615	23,170	65,638
Indiana	17,766	20,542	12,063	50,371
Iowa	14,416	35,690	31,456	81,562
Kansas	16,007	25,354	13,436	54,797
Michigan	15,650	15,348	7,273	38,271
Minnesota	16,257	26,642	20,639	63,538
Missouri	41,292	33,193	10,685	85,170
Nebraska	7,972	21,700	18,205	47,877
North Dakota	4,363	14,264	8,659	27,286
Ohio	24,117	25,132	10,742	59,991
South Dakota	5,042	14,621	9,447	29,110
Wisconsin	15,961	24,485	15,772	56,218
TOTAL	194,696	283,586	181,547	659,829
SOUTH				
Alabama	20,374	8,185	4,694	33,253
Arkansas	19,451	10,457	10,032	39,940
Delaware	577	639	1,078	2,294
Florida	13,298	9,565	5,177	28,040
Georgia	16,058	8,776	7,170	32,004
Kentucky	36,751	30,570	5,601	72,922
Louisiana	10,203	5,390	4,192	19,785
Maryland	4,265	3,474	2,597	10,336
Mississippi	14,084	5,945	4,521	24,550
North Carolina	19,953	12,704	10,146	42,803
Oklahoma	34,060	23,388	6,296	63,744
South Carolina	9,211	3,980	2,280	15,471
Tennessee	42,232	17,380	3,908	63,520
Texas	93,908	47,979	17,000	158,887
Virginia	19,731	12,018	4,121	35,870
WestVirginia	10,622	3,042	633	14,297
TOTAL	364,778	203,492	89,446	657,716
WEST				
Alaska	210	173	47	430
Arizona	2,005	1,594	1,348	4,947
California	19,613	21,912	19,727	61,252
Colorado	8,944	10,107	4,764	23,815
Hawaii	2,362	1,847	448	4,657
Idaho	7,132	7,148	4,791	19,071
Montana	6,115	9,594	5,357	21,066
Nevada	947	956	510	2,413
NewMexico	5,526	3,750	1,726	11,002
Oregon	15,300	8,443	4,568	28,311
Utah	5,736	4,547	1,637	11,920
Washington	10,222	7,307	6,753	24,282
Wyoming	2,398	3,880	1,900	8,178
TOTAL	86,510	81,258	53,576	221,344
US	685,718	602,905	345,988	1,634,611